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IS TRANSFORMATIONAL LEADERSHIP EFFECTIVI

IN A SYSTEM PROGRAM OFFICE?

THESIS

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Abstract

The purpose of this study was to examine the effectiveness of the leadership styles of government leaders in the weapon systems acquisition community within Air Force Systems Command (AFSC). This study centered on two types of leadership: transactional and transformational leadership. The primary objective was to show that transformational leadership was more effective in an acquisition environment than transactional leadership. It was further proposed that leadership acts through a set of mediating variables which, in turn, affect the leader's effectiveness.

Focusing on the System Program Office directors and the heads of functional directorates at AFSC's product divisions, subordinates of these leaders were surveyed to determine leadership characteristics of their directors in addition to the strengths of other mediating variables. These other variables were performance feedback, cohesion, goal clarity, goal difficulty, and support for creativity. A model of leadership was developed illustrating the relationship of leadership, effectiveness, and these mediating variables.

Analysis of the survey responses revealed that transformational leadership was significantly more highly correlated with effectiveness than was transactional leadership. The five mediating variables were found to

influence effectiveness in differing degrees. Two of the
variables were dropped from the model because of
multicollinearity involving goal difficulty and a very low
coefficient on the variable goal clarity. The final
leadership model involved the variables feedback, cohesion,
and support for creativity. These variables were related
most strongly to effectiveness of the variables studied.

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I. Introduction

This chapter introduces the reader to the concept of
transformational leaderhip. A brief background of leadership
and its relationship to the systems acquisition process is
presented. Also presented is the purpose for the research
and the research objective, followed by a description of the
overall plan of this thesis.

Background

Leadership is a familiar topic to nearly all Air Force
officers. It is taught to cadets during their pre-
commissioning training at the Air Force Academy (AFA), at
Officer Training School (OTS), and in the Reserve Officer
Training Corps (ROTC). It is also taught to active duty
officers during their professional military education.
Leadership can have many definitions. Bass quoted Koontz and
O'Donnell as defining leadership to be "the activity of
persuading people to cooperate in the achievement of a common
objective" (3:11). A more abstract definition could be
"...the initiation and maintenance of structure in
expectation and interaction" (3:411). The Air Force

definition of leadership is "the art of influencing and
directing people to accomplish the mission" (9:2). Much of
the leadership taught to officers centers around the
situational theory of leadership, which suggests that the
most effective style of leadership depends on the individual
situation the leader is presented with. Different situations
will require different behaviors if the leader is to be
effective (12:261). One of these situational factors, and the
common denominator among all definitions of leadership is
the people involved

A great deal of literature exists concerning the
effectiveness of different leadership styles. This research
studied the effectiveness of two: transactional leadership
and transformational leadership. Most of the studies have
centered around the leadership of factory workers, clerical
personnel, and other "workers." There has been some research
conducted on the leadership of professionals in research and
development (11:12). However, there has been little research
done concerning the effectiveness of transformational
leadership on a professional workforce such as the DOD
systems acquisition community.

Within Air Force Systems Command, the System Program
Office (SPO) is the government office responsible for
managing the aquisition and development of weapons systems.
Working along side the SPOs are functional oraganizations

such as engineering, contracting, logistics, etc. Like most research and development organizations, much of the work is complex and varies from day to day. Most of the people who work in this environment are professionals. They are well educated and trained in their fields of expertise. Most have college degrees. This research examined leadership of professionals in the weapons system acquisition environment. It attempts to add to the pool of information concerning the effectiveness of transformational leadership.

Purpose of the Research

The purpose of this research was to compare the effectiveness of two leadership styles, transactional leadership and transformational leadership, in a SPO environment. Specifically, the overall objective was to compare the effectiveness of transformational leadership with the effectiveness of transactional leadership, as perceived by the leaders' subordinates.

There are many factors that influence leadership effectiveness in a SPO: how well cost, schedule, and performance objectives are met; reliability, maintainability, and survivability; the structure of the organization, the nature of the R&D tasks, and other factors which may serve as substitutes for leadership. This study was centered on the process of leadership. It was proposed that leadership acts through different mediating variables which also impact

effectiveness. Mediating variables, also called intervening variables, are those variables influenced by the independent variable, which, in turn, influence the dependent variable (10:74). The mediating variables selected for this study were as follows: performance feedback, cohesion, goal clarity, goal difficulty, and support for creativity.

These variables were chosen primarily because of the leader's ability to directly influence these areas. For instance, the leader's ability to create an organization that is receptive to creativity and innovation may be an enabling mechanism to encourage subordinates to perform. Program development schedules are more susceptible to impacts by elements outside of the leader's control. Therefore, end-product variables of this type were excluded from consideration for this study.

Thus, using the two leadership styles as predictor variables, and the mediating variables as described above, a leadership model was developed and professionals from the DOD systems acquisition environment were surveyed to assess leadership effectiveness.

Document Layout

Chapter two discusses current literature concerning transactonal and transformational leadership, the five mediating variables listed above, and the characteristics of a professional workforce. Finally, a tentative model of

leadership and effectiveness is presented. Chapter three describes the methods used for data collection and analysis and presents the results along with a revised leadership model. Chapter four discusses the results. Chapter five presents conclusions and recommendations.

II. Review of the Literature

Introduction

The discussion of leadership characteristics focuses on two distinct types of leadership found in current literature. These are transactional leadership and transformational leadership. This chapter describes, compares, and contrasts the characteristics of these leadership types.

Transactional Leadership

The concept of transactional leadership is based on two factors: contingent reward and management by exception. Contingent reward is based on the principles of the path-goal model of leadership, which, in turn, is based on the expectancy theory of motivation. Before discussing contingent reward, the path-goal model and expectancy theory will be examined, then related to contingent reward and transactional leadership.

According to the expectancy theory of motivation, an expectancy is a belief in the liklihood that a certain action or behavior will lead to a certain outcome (8:103). For example, consider a person who believes that if he works a little harder, he may receive a pay raise. If that person believes the probability of a pay raise is high, he will be motivated to perform his job at that level. If the person does not expect to receive this reward, he will not be as

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motivated to perform. The same holds true for the undesirable aspects of expectancies. If a person expects to be fired from the job the next time he is late to work, that person will be motivated to arrive on time. This is a brief description of expectancy theory which forms the basis for the path-goal model of leadership.

According to the path-goal model, a leader has two responsibilities to fulfill (8:416). First, he must make clear and obvious the path his subordinates must take in order to achieve both corporate and personal goals/rewards (like a pay raise) and take positive actions to remove obstacles to their accomplishment. According to expectancy theory, these actions by the leader will tend to motivate people. Furthermore, these actions will also act to eliminate ambiguities in subordinates' performance requirements, which can be dissatisfying and demotivating (38:148). According to Kent, "the principle job of any manager...is to clarify an employee's job and role and specify performance standards" (22:44).

Secondly, the leader can increase the rewards themselves that are valued and desired, thus making them even more desired. Yukl quoted House as saying:

> The motivational function of the leader consists of increasing personal payoffs of subordinates for work-goal attainment, and making the path to these pay-offs easier to travel by clarifying it, reducing roadblocks and pitfalls, and increasing the opportunities for personal satisfaction en route [38:144].

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These two theories form the basis for the first factor of transactional leadership, which is contingent reward. Transactional leadership is based on an exchange system between the leader and the subordinates (15:39). Specifically, the transactional leader promises rewards (such as bonuses or promotions) in exchange for a certain performance level (2:11). The main area of emphasis here is job performance. Leaders attempt to motivate followers to perform based on the expectancy theory and path goal model. Leaders make it clear what goals/objectives the subordinates are to achieve. They also make clear the rewards available for doing a satisfactory job. Through these goal/reward discussions, the leader and the follower reach an understanding and a "contract" is established. This represents the terms of the agreement concerning the subordinate's performance and the rewards that may be expected for that performance. The contract between leader and follower may be written or unwritten, formal or even informal. To be effective, a leader must live up to the expectations of his followers and deliver the agreed upon rewards for performance (24:649). If the leader does not fulfill his followers' expectations, the informal contract will have been violated. Followers will quickly lose their motivation to perform and will probably also lose their respect and trust for the leader.

Contingent reward may also involve not imposing adverse reinforcements (2:121). An example of this is a leader agreeing not to penalize an employee for arriving to work late when there are extenuating circumstances. But, although a transactional leader may show concern for the individual needs of his subordinates, he will only try to satisfy them as long as they do not conflict with the subordinates' job performance (2:11). If the leader perceives the immediate needs of the job as critical, he will be less likely to allow the subordinate to arrive late or miss work, regardless of any extenuating circumstances. Again, current job performance is the principal criteria by which transactional leaders deal with their subordinates.

The second major characteristic of transactional leadership is known as management by exception. This approach is centered around the familiar philosophy, "if it ain't broke (sic), don't fix it" (5:80). This characteristic reflects an attitude that is content with things as they are. As long as operations proceed satisfactorily, the transactional leader will be content not to initiate any changes or corrective actions. The transactional leader will step in to change the situation only on an exception basis, when a subordinate's performance deteriorates, or when organizational conditions dictate a change is necessary. Bass calls this principle conditional-adverse reinforcement (2:211). In other words, the leader's adverse reinforcement

or change initiation actions are conditional; something must go wrong before the leader tries to correct it.

This differs from the adverse reinforcement aspect of contingent reward. Simply not imposing adverse reinforcements if performance requirements are met is a passive management technique. Correcting a deficiency through adverse reinforcement is a more active management technique. However, management by exception should not be viewed as a proactive management technique. Watching the organization operate, then stepping in to solve problems after they occur is a reactive management style. This may place the leader in a constant defensive mode.

Thus the overall nature of the transactional leader is primarily a passive one. The exception may be the emphasis on active goal setting during the "contract" negotiation phase of contingent reward. Transactional leaders are typically more interested in efficient processes than in long range objectives (2:122). Nevertheless, if operations are satisfactory, and even if change could improve the process, transactional leaders will refrain from changing them.

Transformational Leadership

Transformational leadership is characterized by a genuine concern for people as individuals as well as for the organization as a whole. Transformational leaders are not only concerned with the details of their subordinates' needs but are also keenly aware of the long term needs of the

organization. Transformational leaders are change agents who set the strategic goals for their organization and inspire their followers to pull together to meet those goals.

Transformational leadership can be characterized in several ways; the first is charisma. Charisma is a term that frequently invokes images of politicians, religious leaders, war heros, and media celebrities. It has been used almost to the point of becoming trite. Fundamentally, charisma refers to a strong, attractive and inspiring personality (2:35). It was previously said that transformational leaders have the ability to inspire and motivate their followers. They can stimulate feelings of commitment and loyalty. House described charismatic leaders as those "who by force of their personal abilities are capable of having profound and extraordinary effects on followers" (16:189).

Whereas a transactional leader can motive his followers to perform by virtue of the exchange agreement or the contract between them, the transformational leader motivates his followers by virtue of his personality. A transactional leader can motivate his followers to perform up to standards, but the transformational leader can motivate his followers to do more than is expected (2:20). Transformational leaders encourage followers to achieve higher levels of output. House quoted Tucker in describing the relationship of followers to the charismatic leader. "They do not follow him

out of fear or monetary inducement, but out of love, passionate devotion, enthusiasm" (16:191).

In addition to encouraging a higher level of performance, transformational leaders help followers to satisfy their higher level needs (such as self-esteem and self-actualization). The transformational leader himself tries to identify subordinates' potential motives and to satisfy their higher level needs (6:4). Transactional leaders motivate followers through a simple exchange type of relationship, such as a pay raise for job performance. Transformational leaders motivate their followers "to work for transcendental goals and for higher-level, self-actualizing needs" (4:8). Bass described three interrelated ways in which this higher level motivation occurs:

> 1) By raising our level of awareness, our level of consciousness about the importance and value of designated outcomes, and ways of reaching them.
> 2) By getting us to transcend our own self-interest for the sake of the team, organization, or larger polity.
> 3) By altering our need level on Maslow's...heirarchy or expanding our portfolio of needs and wants [2:20].

Tichy and Ulrich view transformational leadership in the context of change. They suggest transformational leadership is necessary when there is a need to change or revitalize an organization. A transactional leader may recognize the need for change but the transformational leader is more sensitive to the signals that indicate a change will be necessary in the future. Moreover, the transformational leader makes sure

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that key decision makers are responsive to these signals as well. Under his charismatic leadership, suboreinates are made to feel a dissatisfaction with the status quo (34:30). The objective of this lower threshold of awareness is to recognize the need for change before the situation becomes critical (34:53). The idea is to change before change becomes necessary, to solve a problem before it becomes a problem. However, transformational leaders must be able to do more than identify the need for change.

To be successful at implementing a major organizational change, the transformational leader must be able to overcome resistance to change. It is primarily through a charismatic personality that transformational leaders can evoke "fundamental changes in the basic political and cultural systems in the organization" which are necessary for a major organizational transformation to succeed (35:59). Overcoming the resistances to change and encouraging permanent behavioral changes in these two corporate "systems" is one factor that separates the transformational leader from the transactional leader.

In addition to having a charismatic personality, and in line with being change agents, transformational leaders are visionaries. They are able to create "a positive view of what the organization can become" (34:28). This vision of a future organization then becomes the organization's goal, its model. The transformational leader is able to create "mental

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and verbal pictures of desirable future states," and transform them into a new reality for his followers (7:38). He inspires his subordinates to follow the visions into the future (34:122). This is especially true for leaders of innovative organizations who must not only develop new directions for their organizations, but also infuse that direction with energy and vitality. "They personally work on energizing the organization by demonstrating their own excitement, optimism and enthusiasm" (36:92). According to Farris, true leadership involves "a vision of where the organization should be, a sense of how to get there, and an ability to inspire others to move in that direction" (11:13). Without motivated people to turn visions into reality, visions would remain visions. Thus the leader's visionary abilities are related to and may even depend on his charisma for success.

There is some disagreement, however, on the nature and importance of a leader's visionary skills. Tichy and Ulrich describe a transformational leader as being proactive, not relying on committees and staffs to set up a corporate vision (35:63). Byrd describes visionary skills as one of five essential skills for effective leaders (7:38). In examining executives and CEO's who have transformed their organizations and who have lead them in new directions, Tichy and Devanna suggest it is up to the transformational leader to develop holistic visions of the future for their organizations and

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inspire other leaders within their organizations to do the same (34:124).

On the other hand, Bass does not specifically address visionary ability as a major characteristic of a transformational leader. Although he seems to agree that it is important, instead, he tends to include it within the leader's overall charisma. In a survey involving what Bass called world-class leaders, his students read leaders' biographies and rated these leaders as to their perceived charisma. "To earn a high score on charismatic leadership, the leader would have to...have a special gift of seeing what is really important, and to have a sense of mission" (4:10). This logic seems somewhat flawed. Although charismatic leaders probably possess visionary abilities, a visionary leader is not necessarily a charismatic or transformational leader.

The characteristics of charisma and visionary abilities could be studied as separate variables or combined into a single leadership charcteristic. This research focused on the lieutenant colonels, colonels, and their civil service counterparts in the Air Force weapons system acquisition environment. In such an bureaucracy, visionary abilities may be less important and less obvious than a charismatic personality. Visions of the future organization may even be pushed down upon the organization from higher authorities. Because of this, and because the visionary abilities of a

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leader within a SPO are probably not as visible as his personality attributes, charisma was chosen as a prime transformational leadership characteristic to be measured.

Another major characteristic of transformational leadership is what Bass calls individual consideration. As the name implies, it involves paying attention to individual subordinates (5:75). It applies not only to the more senior and influential staff members but to new-comers and neglected subordinates as well (5:79). There seems to be a general agreement on this characteristic throughout the literature. According to Tichy and Devanna, transformational leaders believe in people and are not dictators (34:271). Farris stressed than an effective leader must be a personnel developer, one who is sensitive to the needs of his people regardless of how new or how senior (11:15). Miller predicts an increasing importance being placed on developing an "improved understanding of people and an improved relationship between the leader and the professional" (30:45).

A transformational leader does not stop with simply understanding his followers, or even with satisfying their needs. He goes on to "arouse and elevate those needs in an attempt to develop subordinates further" (5:75). Again, the transformational leader is distinguished from the transactional leader. The transformational leader is not satisfied with the status quo but continually seeks to make

improvements and encourages his followers to do likewise. In so doing, he "engages the full person of the follower" and may even turn his followers into leaders (6:4). It is apparent that this aspect of individual consideration, like creating visions, can only be successful if the leader is able to inspire his followers. Again, the personality and charisma of the leader play a crucial role in the interactions of the leader with his followers.

Bass described another transformational leadership characteristic as intellectual stimulation. This involves encouraging followers to develop new ideas and to think about old problems in new ways (5:75). This view is consistent with Tichy and Devanna's idea of the proactive nature of transformational leadership. They view transformational leadership as encouraging the "devil's advocate" role in key subordinates. Subordinates are encouraged not to arbitrarily accept things as they are, but to strive for creativity and innovation (34:53). Burns referred to a result of transforming leadership as being a "relationship of mutual stimulation" between the leader and his subordinates" (6:4).

The concepts behind transactional and transformational leadership are different. They paint a picture of two different types of leaders. Kuhnert and Lewis suggest that leadership behavior is determined by the personality of the leader.

> Transactional and transformational leaders are
> qualitatively different kinds of individuals who
> construct reality in markedly different ways, thereby
> viewing themselves and the people they lead in
> contrasting ways [24:649].

Thus the techniques a leader chooses to employ may vary from one situation to the next, but the fundamental personality structures that produce the behavior are very stable (24:650). This could suggest that if transformational leadership is in fact a leadership of a higher level, then a transformational leader could include transactional leadership techniques and behaviors as a part of his overall repertoire of leadership methods. It suggests that transformational leaders are cognitively aware of, and practice higher order behaviors such as individualized consideration and intellectual stimulation in addition to contingent reward. This is supported by Bass, Avolio, and Goodheim. Concluding a study of the "falling dominoes" effect of transformational leadership on subordinates, they stated that the concepts of transactional and transformational leadership were theoretically distinct, but in reality were displayed on a spectrum of leader behavior. One leader could use "different amounts and intensities" of the two leadership characteristics. They stated that "transformational leadership augments the effects of transactional leadership, rather than substituting for it..." (4:16).

Tichy and Devanna also draw a distinction between transactional and transformational leaders. Their views also support the idea that the two types of leaders are fundamentally different. They suggest that a major difference stems from the proactive nature of the transformational leader.

> What may separate transformational from transactional leaders is that transformational leaders are more likely to be...more creative, novel and innovative in their ideas; more radical or reactionary than reforming or conservative in ideology; and less inhibited in their search for solutions. Transactional leaders may be equally bright but their focus is on how to best keep the system running...reacting to problems generated by observing deviances [34:124].

Having discussed the nature of transactional and transformational leadership, characteristics which will serve as predictor variables in the leadership model, the next step is to describe the environment in which the leader must act. Specifically, the subordinates themselves will be examined in the next section. The key features of the professional SPO workforce will be discussed and a set of mediating variables will be developed for use in the leadership model.

The SPO Workforce

This research focused on the Air Force System's Command (AFSC) system program offices (SPOs). Product divisions within AFSC are large matrix organizations. Individual functional directorates such as engineering and contracting, operate along side "independent" project organizations such as the F-16, C-17, and B-1 SPOs. The nature of the workforce

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makes this environment different from that described in much of the current leadership literature. Most of the military staff at ASD are officers. Virtually all officers have college degrees, many in engineering or other technical areas. The same is also true of the civilian personnel. This type of highly educated, professional workforce implies unique workforce characteristics, and forms the basis for a discussion of the mediating variables used in the transformational model of leadership.

Kerr, et. al. described several characteristics of "ideal" professionals, one of which is their expertise (23:332). Much of professionals' expertise comes from extensive formal schooling. They bring to their job a higher level of specialized education, usually in a field of abstract knowledge. As a result of their higher education, professionals have higher demands and more specific expectations of their work (30:44). A leader must be more explicit in establishing goals and objectives and communicating them to professionals in the organization. Hence, as goal setting becomes important, the previously discussed path-goal theory comes into play. Recall that it is important for the leader to make the subordinates' roles in the organization clear and unambiguous, or the subordinates may become demotivated in their jobs. This introduces the first mediating variable in the leadership model, goal clarity.

Mediating Variables

Tushman and Nadler discussed effective leadership and goal clarity in innovative organizations. They found that executive leaders in organizations that stress innovation should do the following:

> Develop and communicate a clear image of the organization's strategy and core values...If objectives are unclear...individuals and groups will focus on the status quo [36:90].

In a discussion on how to motivate followers, Sherwood stressed the importance of making sure followers know how their tasks relate to the organizational goals and objectives (32:15). This stresses the need for feedback. Kent suggested that the primary job of any leader is to ensure that goals and performance standards are clearly understood (22:44). In discussing a theory of leadership developed by Hackman and Walton, Gist, et. al. stated that one of the primary ingredients of team effectiveness was "clear and engaging directions" and that one of the leader's primary functions was providing that direction (13:241). McGinniss and Verney related this idea to innovation, suggesting that those who understand organizational goals are more likely to be innovative (29:23). For an organization such as ASD, dependant on innovation, with a workforce that is largely professional, goal clarity is an important factor in determining the effectiveness of its leadership.

Related to goal clarity is the goal difficulty, or goal challenge. Ivancevich and McMahon examined the effects of

six task-goal attributes, including goal clarity and goal difficulty, on the performance of work groups using higher order need strength as a moderating variable. They found a stronger relationship between goal clarity and goal difficulty and performance for individuals with high higher order needs strength than for individuals with low higher order needs strength (18:552). In reviewing twelve studies involving goal setting, Locke found that people who were given more challenging goals consistently performed better than those who were given less challenging goals (26:162). For this study, the a priori assumption was made that a professional workforce such as the one under study would have a relatively high higher order needs strength. Therefore, individuals should respond positively to challenging or difficult work goals.

Weapons systems development programs often stress innovation. In some programs, technical innovation is of paramount importance. In other programs, innovation in areas as seeminly mundane and routine such as contracting is heavily stressed (13:34). Support for creativity in both approaches and solutions to problems is one characteristic of innovative organizations (33:555). According to Likert, "the supportive atmosphere of the highly effective group stimulates creativity" (25:168). McGinniss and Verney recognized the need for commitment to innovation at the top or innovation will fail (29:23). Thus, the leader's support

for creativity, a measure of the work climate created by the leader, was chosen as a mediating variable. Additionally, creativity could be used as a rough estimate of the amount of autonomy given to subordinates.

Kerr, et. al. described autonomy as "a perceived right to make choices which concern both means and ends" (23:332). Miller described autonomy as a lack of management (30:44). Manz and Sims summed these two descriptions in their discussion of self-managed work groups. Self-managed, or autonomous work groups can be characterized by "a high degree of decision-making, autonomy, and behavioral control" (27:423). Whether a professional's autonomy is considered individually or in work groups, autonomy is very important to professionals. "It seems to be the one psychic income that professionals value most highly and even equate with being professional when working for an organization" (31:64).

The assertion here is that if autonomy is not perceived to be present, (that is, if the leader "micromanages" his subordinates), creativity will be stifled. Conversely, an individual who perceived a high degree of support for creativity from his or her leader would also perceive a high degree of autonomy in his work. Thus, support for creativity was chosen as a mediating variable that could represent a measure of autonomy.

Specific job-related feedback is another important factor in discussing organizational effectiveness. Many

studies have been performed which indicate the positive effects of feedback. Job related feedback can serve as a motivating tool (32:15, 1:466). Positive feedback especially can have the additional effect of raising the self-confidence of subordinates whereas no feedvback at all may even inhibit performance (28:845). Wexley and Nemeroff found a direct positive relationship between effectiveness and immediate performance feedback (37:446). Ivancevich and McMahon found that with goal feedback used as a task-goal attribute, its relationship with performance was "significantly larger for the technicians with high higher order need strength than for technicians with low higher order need strength" (18:560). Thus feedback was chosen as a mediating variable.

Finally, cohesion was selected as a mediating variable. Keller reported that group cohesiveness was the strongest predictor of group performance of several indicators studied (20:723). A group of individuals who develop strong friendships with one another, who enjoy each other's company should perform better than individuals who do not like one another. A cohesive group should have better attitudes about work. Some groups even develop strong, emotional bonds with the work itself. Professional groups often fall into this category (30:44). According to Bass, one of the major leadership roles for group effectiveness is to maintain group cohesiveness (3:613). In the author's experience, not only have organizations with a high degree of cohesion tended to

be very effective, but organizations with a low degree of cohesion have tended to be very ineffective.

These mediating variables were chosen because of the leader's ability to influence them. A leader can influence, if not directly control, the degree of goal clarity, goal difficulty, feedback, support for creativity, and cohesion perceived by his subordinates. He can take positive steps to ensure organizational goals are clear and challenging. He can choose the amount of feedback he gives his subordinates. He can create or maintain an atmosphere that encourages creativity and cohesion. The extent to which these variables were present was used as an indicator of effectiveness. With the mediating variables established, the leadership model may then be presented.

Leadership Model

The leadership model proposed by this thesis suggests that leadership acts through a number of mediating variables. These mediating variables in turn influence the leader's perceived effectiveness. The variables used in the model are summarized in Table 1. The model itself is presented in Figure 1. The path coefficients between variables will be presented in the next chapter in addition to the relative effectiveness of transactional and transformational leadership.

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Table 1

Leadership Model Variables

Independent Variable	Mediating Variables	Dependent Variable
Leadership	Feedback	Overall Effectiveness
	Cohesion	
	Goal Clarity	
	Goal Difficulty	
	Support for Creativity	
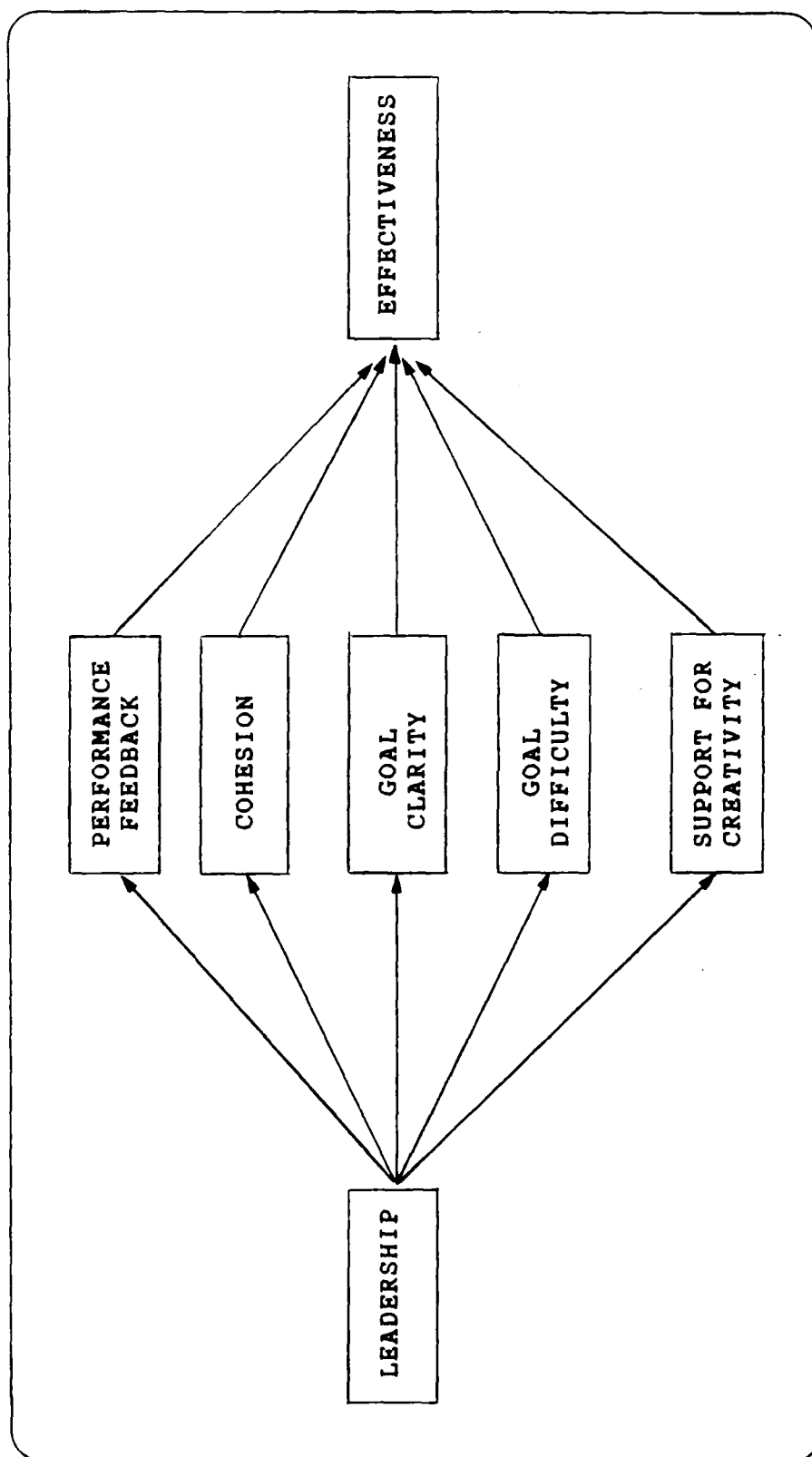
Figure 1
Leadership Model

III. Methodology and Results

This chapter describes the survey methodology for collecting and analyzing data for this study. It also presents the results of the data analysis and a resulting revision to the leadership model.

Data Collection

A survey was used to gather data from employees who were active in systems acquisition. The respondents were currently students in a three week Air Force Institute of Technology's professional continuing education (PCE) class on Acquisition Planning and Analysis (Sys 200). There were several reasons for this approach.

These subjects fell 100 percent into the subordinate level of systems acquisition organizations. Subordinates would provide a more objective description of leaders' behavior than a survey or interview of the leaders themselves. Leaders' superiors, typically at the executive level, are primarily concerned with the end product. (For example, whether a weapon system development is following cost and schedule projections, or whether weapons systems are being delivered as promised.) Subordinates, on the other hand, being on the receiving end of the leaders' behavior arguably have visibility into the leadership process itself. This study focused on the leadership process, the differences between the transactional and transformational leadership

processes, and their relative effectiveness. Therefore, the survey focused on subordinate perceptions.

Secondly, the number of respondents made a survey much more practical and less costly than an interview method of data collection. Thirdly, the nature of the questions made a survey preferable to an interview. The questions asked for opinions of the leaders' behavior, and their effectiveness. It was felt that there would be a greater sense of anonymity in responding to a survey than an interview, that respondents would be more willing to express their true feelings and impressions anonymously on paper than in person to an interviewer.

Fourthly, the students were chosen as representative of the systems acquisition community. Sys 200 is a three week course that teaches aspects of the systems acquisition process. The students work directly in SPOs, in functional offices such as engineering, in test organizations, and in staff offices. The course is multi-disciplined in nature and its students, although a convenient sample, should consititute a fairly representative set.

Lastly, the physical location of the Sys 200 class allowed the author to administer the survey, explain its purpose, and answer questions.

Survey Instrument

The survey instrument was designed to collect perceptions of the leadership and organizational variables discussed in chapter two. The survey questions were extracted from published sources. Table 2 lists the sources of the survey questions. A copy of the entire survey is found in Appendix A.

Data Analysis and Results

The following assumptions were made about the survey data collected. As was mentioned above, the data was assumed to be representative of the systems acquisition population. (Table 3 summarizes the demographic data of the respondents and the leaders they evaluated.) Secondly, the data was treated as interval data. This allowed the use of correlation analysis, regression, and path analysis to test the relationships among the leadership model variables.

The Statistical Analysis System (SAS) software package was used to analyze the data; Appendix B contains the SAS program written for this study. The first step was to combine the survey questions into the leadership model variables. Table 4 lists the survey questions that were combined to make up each variable, and the names given to each variable in the computer program. Feedback, for example, was named VAR1. Also listed are the variables that were combined to form the transactional and transformational leadership scales (TALSCALE and TFLSCALE).

Because of the way the response scales were constructed in the survey, that is, with strongly agree coded as a 1 and strongly disagree coded as a 5, the responses had to be reverse scored by the computer. The only exceptions were questions 39 and 44. Because of the way the response scales were constructed, these two negatively worded questions were correctly coded from the start. All the others were reverse scored by the SAS program.

The second step was to perform a correlation analysis to determine the relationships of transactional leadership and transformational leadership to overall effectiveness. The correlation matrix, presented in Table 5, shows that transformational leadership scale (TFLSCALE) correlates higher with effectiveness than does transactional leadership (TALSCALE). The result is statistically significant as is indicated by the probability of random occurance of the correlation. This is represented by the second number, under the correlation coefficient. The SAS correlation analysis also produced the means and standard deviations of the variables. This is reported in Table 6.

The third step was to examine a more complicated model of leadership, that proposed in chapter 2. The path coefficients for this model were obtained by performing a series of linear regressions. Appendix C contains the Analysis of Variance tables which were the results of the regressions.

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Table 2

Survey Sources

Variable	Source	
Performance Feedback	Jennings	(19:147)
Cohesion	Jennings	"
Goal Clarity	Jennings	"
Goal Difficulty	Jennings	"
Support for Creativity	Jennings	"
Charisma	Bass	(2:201)
Contingent Reward	Bass	"
Individualized Consideration	Bass	"
Management by Exception	Bass	"
Intellectual Stimulation	Bass	"
Extra Effort	Bass	"
Inspirational Leadership	Bass	"

Table 3

Summary of Survey Demographic Data

Question	Item	Distribution of Responses	
49.	Sex of leader	Male	76
		Female	1
50.	Rank of leader if military	Colonel or above	39
		Lt. Colonel	11
		Major	2
		Captain	1
51.	Rank of leader if civilian	GS-12	0
		GS-13	2
		GS-14 or GM-14	5
		GS-15 or GM-15	15
		SES	4
52.	Role of leader	SPO director	33
		Functional director . . .	29
		Other	14
53.	Length of time working with leader	Three months or less . . .	1
		Over three months but less than six months	8
		Over six months but less than one year	28
		Over one year but less than two years	19
		Over two years	1
54.	Rank of respondents if military	Second Lieutenant	2
		First lieutenant	12
		Captain	20
		Major	11
		Lt. Colonel	5
55.	Rank of respondents	GS-8 or below	0
		GS-9	3
		GS-10	0
		GS-11	4
		GS-12 or above	21
56.	Sex of respondents	Male	64
		Female	13

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Table 3

Summary of Survey Demographic Data
(continued)

57.	Respondents' job assignment	Directly in a SPO	27
		Functional, home office .	14
		Functional, colocated . . with a SPO	20
		Other	15
58.	Frequency of contact with leader	Once or twice a month . .	9
		Once a week	11
		Two or three times . . . . a week	19
		Daily	38

The first regression run used overall effectiveness (VAR13) as the dependent variable and the five organizational variables (VAR1-VAR5) as predictor variables. The adjusted R squared value was 0.6005, indicating the model was fairly accurate. However, the standardized coefficient for predictor variable VAR4 was -0.033 indicating a multicollinearity problem with this variable. In the second regression run, VAR4 was eliminated from the model. Also, the coefficient on VAR3 was very small compared to the other predictor variables so VAR3 was eliminated from the model. In the second regression run, VAR13 was regressed against VAR1, VAR2, and VAR5. This time, the overall adjusted R squared value was slightly higher, 0.6077. This suggests that the variables feedback, cohesion, and support for creativity form the best set of mediating variables in

Table 4

Survey Questions and Leadership Model Variables

Leadership Model Variable	Survey Question Numbers
Performance Feedback (VAR1)	43 + 44
Cohesion (VAR2)	32 + 33 + 34
Goal Clarity (VAR3)	25 + 27 + 28 + 31
Goal Difficulty (VAR4)	26 + 29 + 30
Support for Creativity (VAR5)	35 + 36 + 37 + 38 + 39 + 40 + 41 + 42
Charisma (VAR6)	1 + 6 + 10 + 15 + 22
Contingent Reward (VAR7)	18 + 20 + 21 + 24
Individualized Consideration (VAR8)	2 + 3 + 4 + 5
Management by Exception (VAR9)	9 + 19 + 23
Intellectual Stimulation (VAR10)	7 + 11 + 12
Extra Effort (VAR11)	8 + 16 + 17
Inspirational Leadership (VAR12)	13 + 14
Transactional Leadership (TALSCALE)	VAR7 + VAR9
Transformational Leadership (TFLSCALE)	VAR6 + VAR8 + VAR10 + VAR11 + VAR12

Table 5

Correlation Marix of Leadership Model Variables

PEARSON CORRELATION COEFFICIENTS / PROB > |R| UNDER H0:RHO=0

	VAR1	VAR2	VAR3	VAR4	VAR5	TALSCALE	TFLSCALE	VAR13
VAR1	1.00000 0.0000	0.33361 0.0030	0.60249 0.0001	0.36919 0.0010	0.45551 0.0001	0.43058 0.0002	0.46157 0.0001	0.52020 0.0001
VAR2	0.33361 0.0030	1.00000 0.0000	0.41556 0.0002	0.33615 0.0028	0.51597 0.0001	0.44280 0.0001	0.35809 0.0019	0.63169 0.0001
VAR3	0.60249 0.0001	0.41556 0.0002	1.00000 0.0000	0.41292 0.0002	0.47271 0.0001	0.46359 0.0001	0.33611 0.0036	0.51828 0.0001
VAR4	0.36919 0.0010	0.33615 0.0028	0.41292 0.0002	1.00000 0.0000	0.50552 0.0001	0.26912 0.0232	0.27208 0.0199	0.39583 0.0004
VAR5	0.45551 0.0001	0.51597 0.0001	0.47271 0.0001	0.50552 0.0001	1.00000 0.0000	0.32742 0.0057	0.52963 0.0001	0.72145 0.0001
TALSCALE	0.43058 0.0002	0.44280 0.0001	0.46359 0.0001	0.26912 0.0232	0.32742 0.0057	1.00000 0.0000	0.64060 0.0001	0.43799 0.0001
TFLSCALE	0.46157 0.0001	0.35809 0.0019	0.33611 0.0036	0.27208 0.0199	0.52963 0.0001	0.64060 0.0001	1.00000 0.0000	0.62917 0.0001
VAR13	0.52020 0.0001	0.63169 0.0001	0.51828 0.0001	0.39583 0.0004	0.72145 0.0001	0.43799 0.0001	0.62917 0.0001	1.00000 0.0000

Table 6

Variable Means and Standard Deviations

Variable	Mean	Std. Dev.
Feedback (VAR1)	6.99	2.17
Cohesion (VAR2)	10.93	2.78
Goal Clarity (VAR3)	13.99	3.71
Goal Difficulty (VAR4)	10.71	2.61
Support for Creativity (VAR5)	26.37	5.57
Transactional Leadership (TALSCALE)	20.39	5.04
Transformational Leadership (TFLSCALE)	54.47	15.62
Overall Effectiveness (VAR13)	12.77	2.87

this leadership model. The beta weights, or standardized parameter estimates for VAR1, VAR2, and VAR5 became the path coefficients for the right hand side of the model (21:24).

A set of regressions was also run using the transformational leadership scale, TFLSCALE, as the independent variable and the three organizational variables as dependent variables. This yielded the beta weights to be used as the path strengths on the left side of the

transformational leadership model. The results are presented
in Figure 2. Finally, a set of regressions was run using the
transactional leadership scale, TALSCALE, as the independent
variable and the three organizational variables as dependent
variables. This yielded the beta weights to be used as the
path strengths on the left side of the transactional
leadership model. The results are presented in Figure 3.
Again, the analysis of variance tables from these regressions
can be found in Appendix C.

Path analysis techniques were used to analyze the two
leadership models (21:26). Figure 4 shows the basic model.
In this figure, X and Y represent the independent and
dependent, or exogenous and endogenous variables,
respectively. A, B, and C represent the mediating variables
in the leadership model. Each path coefficient is
represented by p. According to the path diagram technique,
the model can be represented by the following structural
equation:

$$Y = (p_{YA})(A) + (p_{YB})(B) + (p_{YC})(C) \tag{1}$$

Similarly,

$$A = (p_{AX})(X)$$

$$B = (p_{BX})(X) \tag{2}$$

$$C = (p_{CX})(X)$$

Substituting equations (2) into (1) yields the following:

$$Y = X(p_{YA}p_{AX} + p_{YB}p_{BX} + p_{YC}p_{CX}) \tag{3}$$
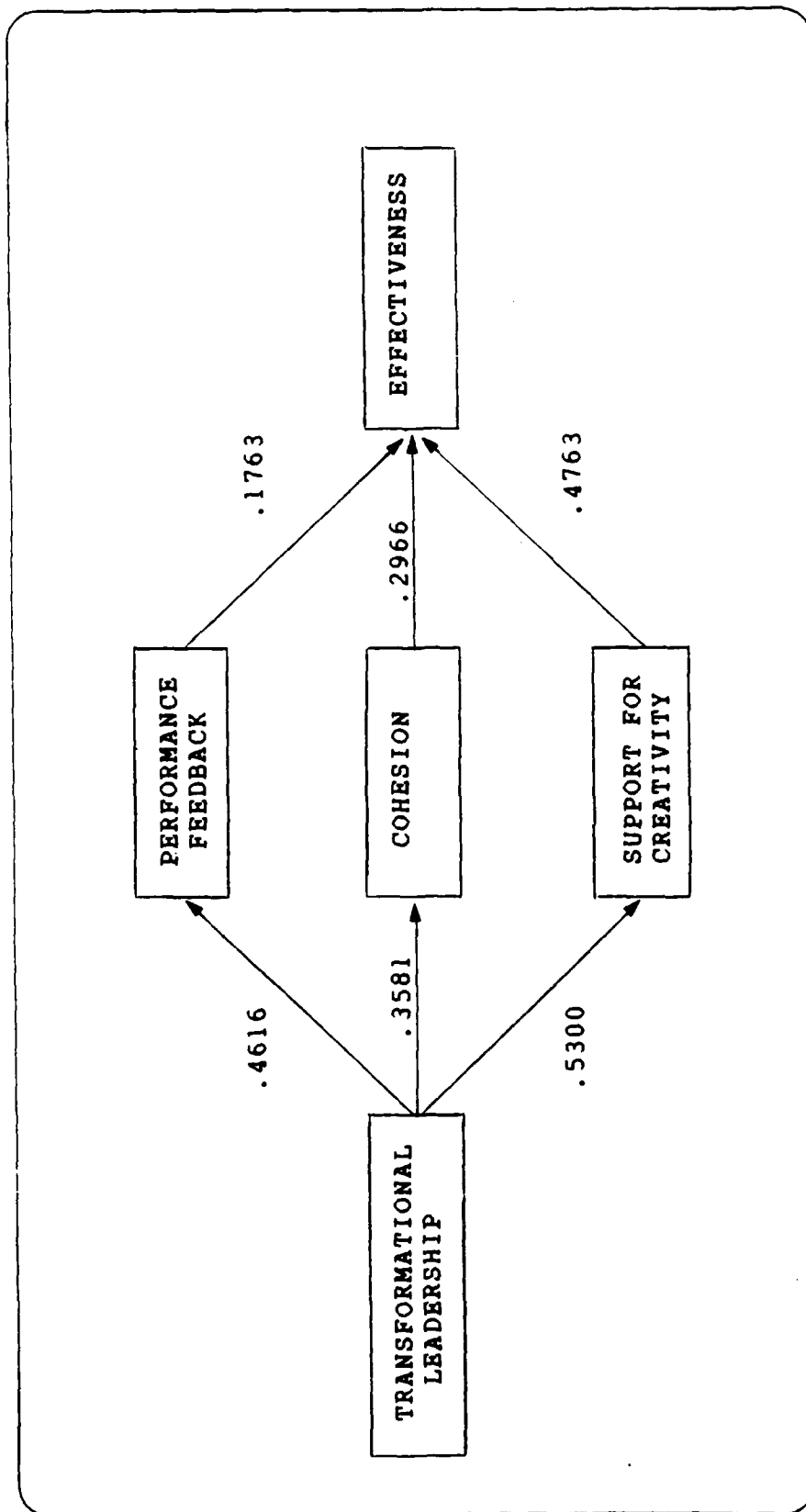
Figure 2
Revised Leadership Model
Transformational Leadership
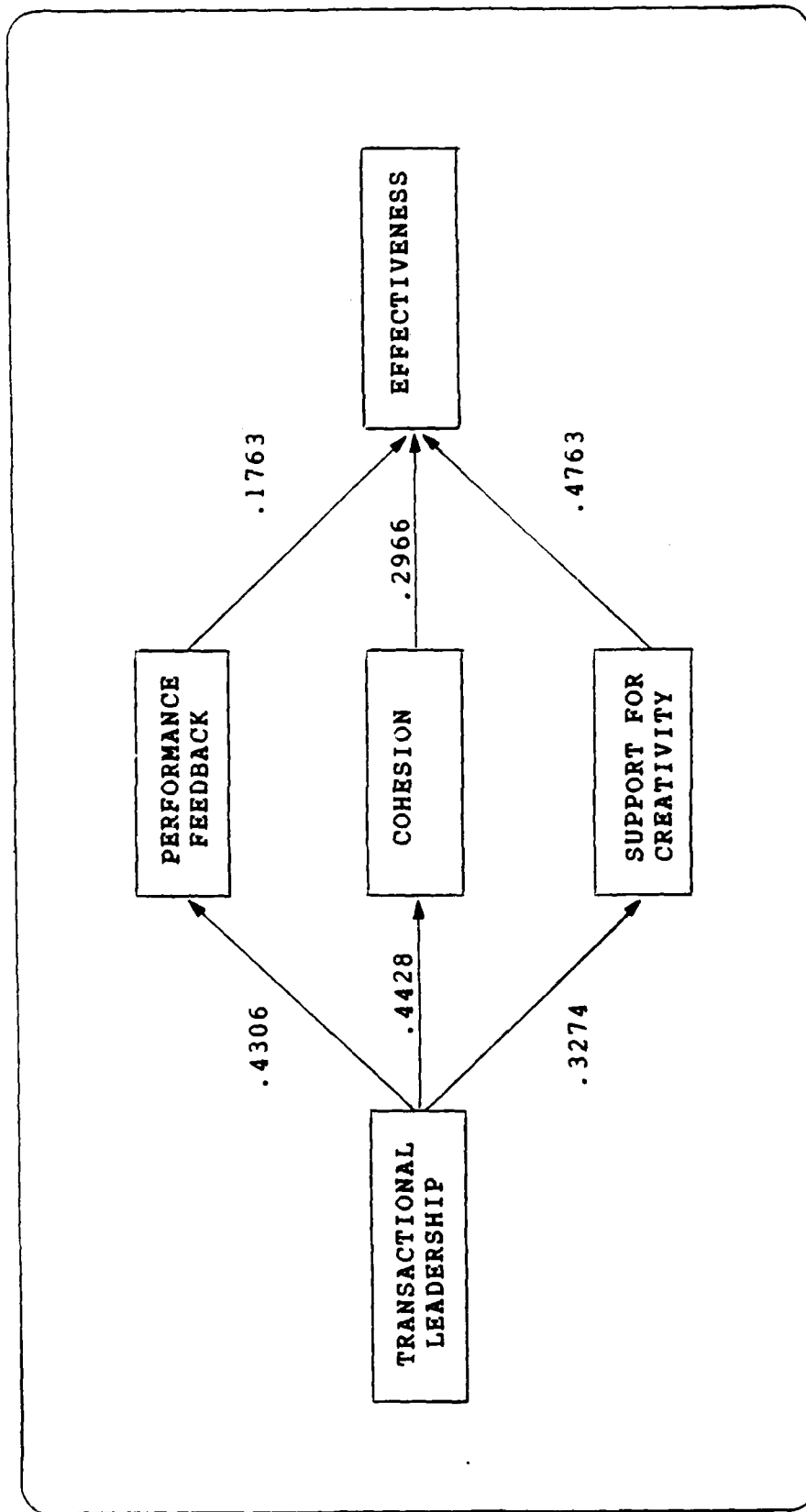
Figure 3
Revised Leadership Model
Transactional Leadership

Using the transformational and transactional leadership models and their respective path coefficients, the following relations are obtained:

Effectiveness = [(.1763)(.4616) + (.2966)(.3581)

+ (.4763)(.5300)] x transformational leadership

Effectiveness = (.4400) x transformational leadership   (4)

Effectiveness = [(.1763)(.4306) + (.2966)(.4428)

+ (.4763)(.3274)] x transactional leadership

Effectiveness = (.3236) x transactional leadership   (5)
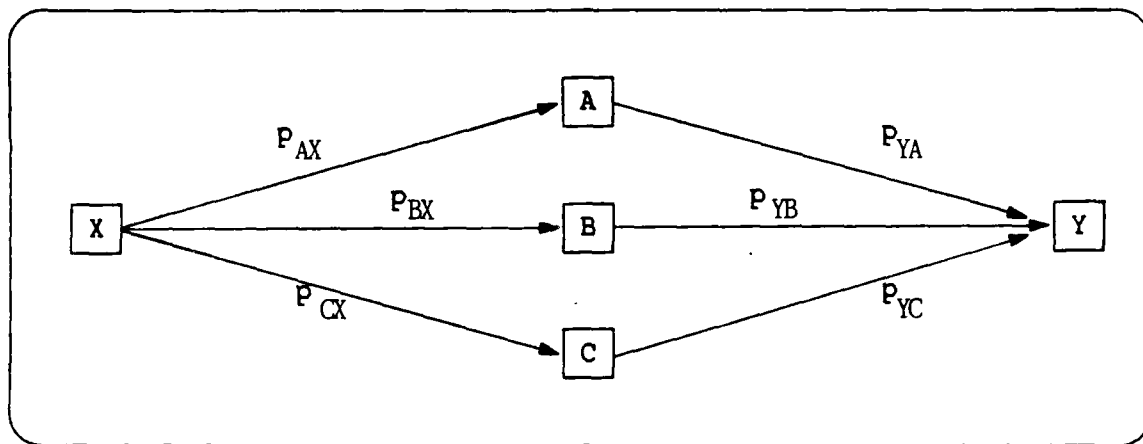
Figure 4

Path Analysis Model

IV. Discussion

The primary objective of this study was to show that transformational leadership is more effective than transactional leadership in a SPO environment. This was empirically suggested by the study in two ways. First, the correlation matrix in Table 5 shows that transformational leadership is more highly correlated with perceived effectiveness than is transactional leadership. This in itself affirms the hypothesis presented in the introduction. However, this result, although significant, does not take into consideration the mediating variables proposed in the leadership model. When these variables were integrated into a more complicated model, the path analysis showed that transformational leadership has a greater influence over effectiveness than does transactional leadership. This is shown in equations (4) and (5). This reinforces the result of the simple correlation analysis and affirms the hypothesis.

An examination of the revised leadership models in Figures 2 and 3, and the analysis of variance tables in Appendix C also show the relationships of the mediating variables to effectiveness. As indicated by the path coefficients in Figure 2 and 3, effectiveness is most strongly influenced by support for creativity, with cohesion second, and feedback a distant third. Support for creativity (VAR5) was also found to be the most highly correlated with

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effectiveness in the correlation matrix. This may be due to the fact that innovation is stressed heavily during the development of weapon systems. Furthermore, in Figure 2, tranformational leadership has a greater effect than transactional leadership on support for creativity. Support for creativity was also more highly correlated with transformational leadership, which could be expected from theory. If support for creativity can be linked to autonomy as suggested in chapter 2, this result would reinforce the importance of autonomy to professionals.

As the analysis of variance tables in Appendix C show, the overall R squared value for the multiple regressions involving effectiveness and the mediating variables was highest when all five mediating variables were included in the leadership model. When goal clarity and goal difficulty had to be eliminated from the model, the overall R squared value decreased slightly. However, the adjusted R squared value increased when the leadership model was modified. This, combined with the adjusted R squared value of 0.6077 indicates that the three mediating variables feedback, cohesion, and support for creativity are reasonably good predictors of effectiveness.

Further examination of the correlation matrix reveals another interesting finding. Cohesion, VAR2, was more strongly related to transactional leadership. This was not expected. Two possible explanations are offered for this

result.   First, Howell and Dorfman, in their discussion of
leadership substitutes, suggested the following:

> For professionals, the following will act as strong
> substitutes for managers' instrumental leadership
> behaviors: a subordinate's ability, experience, training
> or knowledge; a subordinate's need for independence;
> and/or the existance of tasks providing their own
> performance feedback [17:32].

The professionals who work in the systems acquisition

environment certainly possess these characteristics.   It may

be that these characteristics, acting as leadership

substitutes, lead to in work groups whose cohesion is not as

strongly related to leadership as it might otherwise be.   If

the workforce were less of a professional nature, there might

be a stronger relationship with transformational leadership.

A second possible explanation may be that cohesion is

influenced by other variables such as goal clarity.   Goal

clarity, VAR3, was more highly correlated with transactional

leadership than transformational leadership.   Furthermore,

cohesion was more strongly correlated with goal clarity than

the other mediating variables, with the exception of support

for creativity.   Perhaps transactional leadership acts

through goal clarity, or some other variables, which in turn

act through cohesion to influence effectiveness.

V.   Conclusions and Recommendations

This study showed that transformational leadership is more strongly related to effectiveness than is transactional leadership.   This was demonstrated both by simple correlation analysis and by a path analysis of the postulated leadership model (involving the mediating variables feedback, cohesion, and support for creativity).

However, leadership is a very complicated subject; this study revealed some surprising findings.   To further understand leadership in professional systems acquisition environment, the following recommendations are made for further research.

Recommendations

The first recommendation is to construct a complete leadership model.   The leadership model in this study did not test paths connecting the mediating variables with one another.   As suggested in the previous section, leadership may act through a variable like goal clarity which in turn acts through a variable like cohesion to influence effectiveness.   It may be that a more complicated model with more paths better describes leadership and effectiveness.

The second recommendation is to include different variables in the leadership model. Candidates include weapon

system program characteristics like cost, schedule, and performance. It may be that the SPO director has influence over these variables and that by controlling them, he can improve his effectiveness.

A third recommendation is to select a different approach to studying leadership. This research focused on the process of leadership and the subordinate perceptions of leader effectiveness. Future study could focus on the product aspect of leadership. Specifically, the leaders' superiors could be surveyed or interviewed to obtain their views of leadership and effectiveness. This approach could take one of several paths. It could center on what measures of effectiveness the superiors use to rate their leaders and their programs. This could be a study of what constitutes effectiveness in the eyes of senior acquisition leaders. It could also center on a comparison of the perceived effectiveness of certain programs. That is, compare the senior leader perceptions with the perceptions of the subordinates in those programs. Are the perceptions related at all?

A fourth recommendation is to conduct a longitudinal case study of a specific development program, one that has experienced a change of leadership. Interview and/or survey the people in that program to determine the impact a change of leadership has had on cost, schedule, and performance, on performance feedback, cohesion, and support for creativity.

A fifth recommendation is to examine the motivation of people under different styles of leadership. Locate two or more leaders whose styles of leadership are very different from one another. Survey the motivation of their subordinates and isolate the effects on their motivation due to leadership style. For instance, one leader may be very detailed in his leadership style. He may "micromanage" his subordinates, reducing their level of autonomy and stifling their creativity. Another leader may lead at a very general level, delegating the details to his subordinates and encouraging their creativity. Does one style motivate people more than another, or do the professional characteristics of the SPO workforce act as leadership substitutes, thereby blurring the distinction between leadership styles and motivation?

As was mentioned in the introduction, the body of literature involving leadership styles, in particular transformational leadership, and professional workers is not as great as for nonprofessional workers. It is hoped that this research contributed to that body of knowledge. Many areas remain to be studied. Further research will lead to a better understanding of leadership and should, in time, lead to better, more effective leaders.

Appendix A: Leadership Questionnaire

This survey represents a study of leadership. There are many different styles of leadership. Some are more effective than others, depending on the situation. Consider the senior leader in your program - that would probably be your program director, or if you come from a functional organization such as engineering, contracting, configuration, etc., the three letter or even two letter functional director. Is he or she an effective leader? In general, is one particular style of leadership more appropriate than another in a System Program Office (SPO)? To help determine an answer, this survey was compiled. Please keep in mind a senior leader you have current knowledge of or have had exposure to when responding to the statements and questions that follow. Thank you for your time.

DIRECTIONS: Listed below are descriptive statements about leaders. For each statement, please judge how frequently your current SPO director or functional director has displayed the behavior described.

Use the following for the five possibile responses.

A	B	C	D	E
Frequently	Fairly	Sometimes	Once in	Not At
If Not Always	Often		A While	All

When an item is irrelevant or does not apply, or where you are uncertain or don't know, leave the answer blank.

1. Makes me feel good to be around him/her.

2. Is satisfied when I meet the agreed-upon standards for good work.

3. Finds out what I want and tries to help me get it.

4. You can count on him/her to express his/her appreciation when you do a good job.

5. Gives personal attention to members who seem neglected.

6. Is a model for me to follow.

7. Has provided me with new ways of looking at things which used to be a puzzle for me.

8. Makes me do more than I expected I could do.

9. Is content to let me continue doing my job in the same way as always.

10. Is an inspiration to us.

11. His/her ideas have forced me to rethink some of my own ideas which I had never questioned before.

12. Enables me to think about old problems in new ways.

13. Inspires loyalty to him/her.

14. Inspires loyalty to the organization.

15. I have complete faith in him/her.

16. Motivates me to do more than I originally expected I would do.

17. Heightens my motivation to succeed.

18. Whenever I feel it necessary, I can negotiate with him/her about what I can get for what I accomplish.

19. Gives me a sense of overall purpose.

20. Tells me what I should do if I want to be rewarded for my efforts.

21. Gives me what I want in exchange for showing my support for him/her.

22. Makes everyone around him/her enthusiastic about assignments.

23. As long as the old ways work, he/she is statisfied with my performance.

24. There is a close agreement between what I am expected to put into the group effort and what I can get out of it.

WORK GOALS

Items 25-31 are descriptive statements about your understanding of goals and objectives that guide your work. For each statement, please indicate the extent to which you agree or disagree.

Use the following for the five possible responses.

A	B	C	D	E
Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

25. I know exactly what is expected of me in performing my job.

26. I must work hard to accomplish what is expected of me for my work.

27. What I am expected to do at work is clear.

28. I understand the priorities associated with what I am expected to accomplish on the job.

29. It takes a high degree of skill on my part to attain the results expected for my work.

30. Results expected in my job are very difficult to achieve.

31. I understand clearly what my supervisor expects me to accomplish on the job.

WORK ATTITUDES

Items 32-42 are descriptive statements about work attitudes. For each statement, please indicate the extent to which you agree or disagree.

Use the following for the five possible responses.

A	B	C	D	E
Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

32. There is a high spirit of teamwork among my co-workers.

33. I feel I'm really a part of my work group.

34. I look forward to being with the members of my work group each day.

A	B	C	D	E
Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

35. This organization is always moving toward the development of new answers.

36. Around here people are allowed to try to solve the same problem in different ways.

37. Creativity is encouraged here.

38. People in this organization are always searching for fresh, new ways of looing at problems.

39. The leadership acts as if we are not very creative.

40. We're always trying out new ideas.

41. This organization is open and responsive to change.

42. People here try new approaches to tasks, as well as tried and true ones.

PERFORMANCE FEEDBACK

Items 43 and 44 are descriptive statements about job performance feedback. For each statement, please indicate the extent to which you agree or disagree.

Use the following for the five possible responses.

A	B	C	D	E
Strongly Agree	Agree	Neither Agree Nor Disagree	Disagree	Strongly Disagree

43. I usually know whether or not my work is satisfactory on this job.

44. I seldom know whether I'm doing my job well or poorly.

OVERALL EFFECTIVENESS

Items 45-48 are descriptive statements about the overall effectiveness of your work group and your SPO Director/ Functional Director. For each statement, please indicate how effective you feel each is.

Use the following for the five possible responses.

A	B	C	D	E
Extremely Effective	Very Effective	Effective	Only Slightly Effective	Not Effective

45. The overall work effectiveness of your unit can be classified as:

46. Compared to all other units you have ever known, how do you rate the unit's effectiveness?
47. How effective is your director in meeting the job-related needs of the subordinates?

48. How effective is your director in meeting the requirements of the organization?

Items 49-52 relate to the leader you described in the first section of the questionnaire. Items 53-58 relate to you directly. Please indicate the most appropriate response.

49. The leader I have been describing is
    A. Male
    B. Female

50. If military, the leader I have been describing is
    A. Colonel or above
    B. Lt. Colonel
    C. Major
    D. Captain

51. If civilian, the leader I have been describing is
    A. GS-12
    B. GS-13
    C. GS-14 or GM-14
    D. GS-15 or GM-15
    E. SES

52. The leader I have been describing is
    A. A SPO director
    B. A Functional director
    C. Other (please specify)_____

53. How long have you worked with the leader you are describing?
    A. Three months or less
    B. Over three months but less than six months
    C. Over six months but less than one year
    D. Over one year but less than two years
    E. Over two years

54. If you are military, what is your rank?
    A. Second Lieutenant
    B. First Lieutenant
    C. Captain
    D. Major
    E. Lieutenant Colonel

55. If you are civilian, what is your rank?
    A. GS-8 or below
    B. GS-9
    C. GS-10
    D. GS-11
    E. GS-12 or above

56. What is your sex?
    A. Male
    B. Female

57. Which statement best describes your assignment?
    A. I am directly assigned to a SPO.
    B. I am assigned to the main, or "home" office of a functional organization.
    C. I am assigned to a functional organization but colocated with a SPO.
    D. Other (please specify)_____

58. How often do you have contact with or have a chance to observe the leader you have been describing?
    A. Once or twice a month or less
    B. Once a week
    C. Two or three times a week
    D. Daily

Appendix B: <u>SAS Program</u>

```
/*  This SAS program was written to analyze the leadership
survey data using correlation and regression analyses.  The
first step is to declare a data set, called thesis1, and
input the survey responses.  The survey questions were
numbered 1, 2, 3,....,58 and correspond to the variables
a, b, c,...., bf.
*/
data thesis2;
  infile survey;
  input a b c d e f g h i j k l m n o p q r s t u v w x y z
    aa ab ac;
  input ad ae af ag ah ai aj ak al am an ao ap aq ar as at
    au av aw ax ay az ba bb bc bd be bf;
/*
Now, because all of the survey questions must be reverse
scored, it is necessary to reverse the coding of the
responses.  In other words, with the exception of survey
questions 39 and 44, which correspond to variables am and ar,
all of the responses which were scored 1 must be reversed to
now read 5.  All of the responses which were scored 2 must be
reversed to now read 4, and so forth.  Questions 39 and 44
are correctly scored as they stand.  The following if-then-
else statements execute this reverse scoring.
*/
  if a=1 then a=5;
    else if a=2 then a=4;
    else if a=4 then a=2;
    else if a=5 then a=1;
  if b=1 then b=5;
    else if b=2 then b=4;
    else if b=4 then b=2;
    else if b=5 then b=1;
  if c=1 then c=5;
    else if c=2 then c=4;
    else if c=4 then c=2;
    else if c=5 then c=1;
  if d=1 then d=5;
    else if d=2 then d=4;
    else if d=4 then d=2;
    else if d=5 then d=1;
  if e=1 then e=5;
    else if e=2 then e=4;
    else if e=4 then e=2;
    else if e=5 then e=1;
  if f=1 then f=5;
    else if f=2 then f=4;
    else if f=4 then f=2;
    else if f=5 then f=1;
```

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```
if g=1 then g=5;
   else if g=2 then g=4;
   else if g=4 then g=2;
   else if g=5 then g=1;
 if h=1 then h=5;
   else if h=2 then h=4;
   else if h=4 then h=2;
   else if h=5 then h=1;
 if i=1 then i=5;
   else if i=2 then i=4;
   else if i=4 then i=2;
   else if i=5 then i=1;
 if j=1 then j=5;
   else if j=2 then j=4;
   else if j=4 then j=2;
   else if j=5 then j=1;
 if k=1 then k=5;
   else if k=2 then k=4;
   else if k=4 then k=2;
   else if k=5 then k=1;
 if l=1 then l=5;
   else if l=2 then l=4;
   else if l=4 then l=2;
   else if l=5 then l=1;
 if m=1 then m=5;
   else if m=2 then m=4;
   else if m=4 then m=2;
   else if m=5 then m=1;
 if n=1 then n=5;
   else if n=2 then n=4;
   else if n=4 then n=2;
   else if n=5 then n=1;
 if o=1 then o=5;
   else if o=2 then o=4;
   else if o=4 then o=2;
   else if o=5 then o=1;
 if p=1 then p=5;
   else if p=2 then p=4;
   else if p=4 then p=2;
   else if p=5 then p=1;
 if q=1 then q=5;
   else if q=2 then q=4;
   else if q=4 then q=2;
   else if q=5 then q=1;
 if r=1 then r=5;
   else if r=2 then r=4;
   else if r=4 then r=2;
   else if r=5 then r=1;
 if s=1 then s=5;
   else if s=2 then s=4;
   else if s=4 then s=2;
   else if s=5 then s=1;
```

```
if t=1 then t=5;
  else if t=2 then t=4;
  else if t=4 then t=2;
  else if t=5 then t=1;
if u=1 then u=5;
  else if u=2 then u=4;
  else if u=4 then u=2;
  else if u=5 then u=1;
if v=1 then v=5;
  else if v=2 then v=4;
  else if v=4 then v=2;
  else if v=5 then v=1;
if w=1 then w=5;
  else if w=2 then w=4;
  else if w=4 then w=2;
  else if w=5 then w=1;
if x=1 then x=5;
  else if x=2 then x=4;
  else if x=4 then x=2;
  else if x=5 then x=1;
if y=1 then y=5;
  else if y=2 then y=4;
  else if y=4 then y=2;
  else if y=5 then y=1;
if z=1 then z=5;
  else if z=2 then z=4;
  else if z=4 then z=2;
  else if z=5 then z=1;
if aa=1 then aa=5;
  else if aa=2 then aa=4;
  else if aa=4 then aa=2;
  else if aa=5 then aa=1;
if ab=1 then ab=5;
  else if ab=2 then ab=4;
  else if ab=4 then ab=2;
  else if ab=5 then ab=1;
if ac=1 then ac=5;
  else if ac=2 then ac=4;
  else if ac=4 then ac=2;
  else if ac=5 then ac=1;
if ad=1 then ad=5;
  else if ad=2 then ad=4;
  else if ad=4 then ad=2;
  else if ad=5 then ad=1;
if ae=1 then ae=5;
  else if ae=2 then ae=4;
  else if ae=4 then ae=2;
  else if ae=5 then ae=1;
if af=1 then af=5;
  else if af=2 then af=4;
  else if af=4 then af=2;
  else if af=5 then af=1;
```

```
if ag=1 then ag=5;
  else if ag=2 then ag=4;
  else if ag=4 then ag=2;
  else if ag=5 then ag=1;
if ah=1 then ah=5;
  else if ah=2 then ah=4;
  else if ah=4 then ah=2;
  else if ah=5 then ah=1;
if ai=1 then ai=5;
  else if ai=2 then ai=4;
  else if ai=4 then ai=2;
  else if ai=5 then ai=1;
if aj=1 then aj=5;
  else if aj=2 then aj=4;
  else if aj=4 then aj=2;
  else if aj=5 then aj=1;
if ak=1 then ak=5;
  else if ak=2 then ak=4;
  else if ak=4 then ak=2;
  else if ak=5 then ak=1;
if al=1 then al=5;
  else if al=2 then al=4;
  else if al=4 then al=2;
  else if al=5 then al=1;
if an=1 then an=5;
  else if an=2 then an=4;
  else if an=4 then an=2;
  else if an=5 then an=1;
if ao=1 then ao=5;
  else if ao=2 then ao=4;
  else if ao=4 then ao=2;
  else if ao=5 then ao=1;
if ap=1 then ap=5;
  else if ap=2 then ap=4;
  else if ap=4 then ap=2;
  else if ap=5 then ap=1;
if aq=1 then aq=5;
  else if aq=2 then aq=4;
  else if aq=4 then aq=2;
  else if aq=5 then aq=1;
if as=1 then as=5;
  else if as=2 then as=4;
  else if as=4 then as=2;
  else if as=5 then as=1;
if at=1 then at=5;
  else if at=2 then at=4;
  else if at=4 then at=2;
  else if at=5 then at=1;
if au=1 then au=5;
  else if au=2 then au=4;
  else if au=4 then au=2;
  else if au=5 then au=1;
```

```
     if av=1 then av=5;
        else if av=2 then av=4;
        else if av=4 then av=2;
        else if av=5 then av=1;
/*
The next step was to combine the above variables into the
leadership model variables.  Table 4 in the text of the
thesis lists the model variables that correspond to the
following variables.
*/
     var1  = aq + ar;
     var2  = af + ag  + ah;
     var3  = y + aa + ab + ae;
     var4  = z + ac + ad;
     var5  = ai + aj + ak + al + am + an + ao + ap;
     var6  = a + f + j + o + v;
     var7  = r + t + u + x;
     var8  = b + c + d + e;
     var9  = i + s + w;
     var10 = g + k + l;
     var11 = h + p + q;
     var12 = m + n;
     var13 = as + at + au + av;

     TFLSCALE = var6 + var8 + var10 + var11 + var12;
     TALSCALE = var7 + var9;
/*
Before proceding with the analysis, execute a frequency count
of the demographic survey questions.  Print the output of the
following procs to the file called results (which is
automatically given a .lis extension by SAS)
*/
proc printto file=results;

proc freq;
   tables aw ax ay az ba bb bc bd be bf;
/*
Now comes the analysis part of the program.  It starts out
with a correlation procedure, which not only produces a
correlation matrix, but also returns the means and standard
deviations of the variables in the matrix.  The next set of
procedures are multiple and simple linear regressions to
determine the beta weights, or the path coefficients for the
leadership models.
*/
proc corr;
   var var1 var2 var3 var4 var5 talscale tflscale var13;

proc reg;
   model var13 = var1 var2 var3 var4 var5 / stb;
```

```
proc reg;
  model var13 = var1 var2 var5 / stb;

proc reg;
  model var1 = talscale / stb;

proc reg;
  model var2 = talscale / stb;

proc reg;
  model var5 = talscale / stb;

proc reg;
  model var1 = tflscale / stb;

proc reg;
  model var2 = tflscale / stb;

proc reg;
  model var5 = tflscale / stb;
/*
Now, execute the whole thing and exit from SAS.
*/
run;
endsas;
```

Appendix C: <u>Analysis of Variance Tables</u>

Analysis of Variance

Regression Procedure – Run #1

DEPENDENT VARIABLE: VAR13

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	5	372.23231656	74.44646331	22.643	0.0001
ERROR	67	220.28823138	3.28788405		
C TOTAL	72	592.52054795			

ROOT MSE	1.813252	R-SQUARE	0.6282
DEP MEAN	12.72603	ADJ R-SQ	0.6005
C.V.	14.24838		

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	1.13987162	1.18622532	0
VAR1	0.18816440	0.13082682	0.14210485
VAR2	0.30530201	0.09906013	0.28655844
VAR3	0.06430028	0.0767946	0.08349124
VAR4	-0.0331798	0.09709569	-0.030359
VAR5	0.24122924	0.05172193	0.47358183

60

Analysis of Varaince

Regression Procedure - Run #2

DEPENDENT VARIABLE: VAR13

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	3	369.73689555	123.24563185	38.171	0.0001
ERROR	69	222.78365240	3.22874859		
C TOTAL	72	592.52054795			

ROOT MSE	1.796872	R-SQUARE	0.6240
DEP MEAN	12.72603	ADJ R-SQ	0.6077
C.V.	14.11966		

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	1.21456972	1.09668375	0
VAR1	0.23341608	0.11290604	0.17627966
VAR2	0.31597615	0.09731759	0.29657726
VAR5	0.24263422	0.04726992	0.47634009

Analysis of Variance

Regression Procedure – Run #3

DEPENDENT VARIABLE: VAR1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	61.73402722	61.73402722	15.704	0.0002
ERROR	69	271.25188827	3.93118679		
C TOTAL	70	332.98591549			

ROOT MSE	1.982722	R-SQUARE	0.1854
DEP MEAN	6.985915	ADJ R-SQ	0.1736
C.V.	28.38171		

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	3.18673697	0.98716871	0
TALSCALE	0.18628569	0.04700878	0.43057556

62

Analysis of Variance

Regression Procedure – Run #4

DEPENDENT VARIABLE: VAR2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	92.67160750	92.67160750	16.828	0.0001
ERROR	69	379.97627983	5.50690261		
C TOTAL	70	472.64788732			

ROOT MSE	2.346679	R-SQUARE	0.1961
DEP MEAN	11.07042	ADJ R-SQ	0.1844
C.V.	21.19774		

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	6.41562554	1.16837765	0
TALSCALE	0.22823936	0.05563792	0.44279681

Analysis of Variance

Regression Procedure - Run #5

DEPENDENT VARIABLE: VAR5

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	236.42201	236.42201171	8.165	0.0057
ERROR	68	1968.94942	28.95513848		
C TOTAL	69	2205.37143			

ROOT MSE	5.380998	R-SQUARE	0.1072	
DEP MEAN	26.54286	ADJ R-SQ	0.0941	
C.V.	20.27287			

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	18.99169944	2.71974467	0
TALSCALE	0.37250249	0.13036111	0.32741840

Analysis of Variance

Regression Procedure - Run #6

DEPENDENT VARIABLE: VAR1

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	70.44643748	70.44643748	19.222	0.0001
ERROR	71	260.21109677	3.66494502		
C TOTAL	72	330.65753425			

ROOT MSE	1.914405	R-SQUARE	0.2130
DEP MEAN	7.068493	ADJ R-SQ	0.2020
C.V.	27.08363		

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	3.62010860	0.81783086	0
TFLSCALE	0.0633129	0.01444097	0.46157290

Analysis of Variance

Regression Procedure - Run #7

DEPENDENT VARIABLE: VAR2

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	62.65558842	62.65558842	10.443	0.0019
ERROR	71	425.97454857	5.99964153		
C TOTAL	72	488.63013699			

ROOT MSE	2.449417	R-SQUARE	0.1282	
DEP MEAN	11.13699	ADJ R-SQ	0.1159	
C.V.	21.99353			

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	7.88486991	1.04638718	0
TFLSCALE	0.05970938	0.01847674	0.35808801

66

Analysis of Variance

Regression Procedure – Run #8

DEPENDENT VARIABLE: VAR5

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PROB>F
MODEL	1	536.45543	536.45543136	27.291	0.0001
ERROR	70	1375.98901	19.65698590		
C TOTAL	71	1912.44444			

ROOT MSE	4.43362	R-SQUARE	0.2805
DEP MEAN	26.77778	ADJ R-SQ	0.2702
C.V.	16.55709		

PARAMETER ESTIMATES

VARIABLE	PARAMETER ESTIMATE	STANDARD ERROR	STANDARDIZED ESTIMATE
INTERCEP	17.19435604	1.90743783	0
TFLSCALE	0.17687936	0.03385858	0.52962980

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Abstract

The purpose of this study was to examine the effectiveness of the leadership styles of government leaders in the weapon systems acquisition community within Air Force Systems Command (AFSC). This study centered on two types of leadership: transactional and transformational leadership. The primary objective was to show that transformational leadership was more effective than transactional leadership. It was further proposed that leadership acts through a set of mediating variables which, in turn, affect the leader's effectiveness.

Focusing on the System Program Office directors and the heads of functional directorates at AFSC's product divisions, subordinates of these leaders were surveyed to determine leadership characteristics of their directors in addition to the strengths of other mediating variables. These other variables were performance feedback, cohesion, goal clarity, goal difficulty, and support for creativity. A model of leadership was developed illustrating the relationship of leadership, effectiveness, and these mediating variables.

Analysis of the survey responses revealed that transformational leadership was significantly more highly correlated with effectiveness than was transactional leadership. The five mediating variables were found to influence effectiveness in differing degrees. Two of the variables were dropped from the model because of multicollinearity involving goal difficulty and a very low coefficient on the variable goal clarity. The final leadership model involved the variables feedback, cohesion, and support for creativity. These variables were related most strongly to effectiveness of the variables studied.